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ABSTRACT

This document describes the Technology Education Teacher Center, which was designed as a pilot model for a specific field of study--technology education. The first section of the document examines the development of the Center during its five years of operation. The second section discusses the design of the Center, concentrating on the following topics: (a) change process; (b) technology model; (c) program design; and (d) purpose, function, and scope of the Center's programs. The third section lists program objectives, including a) organizational-operational objectives, b) instructional-educational objectives, c) field and community services, d) education and technology resources, and e) secondary objectives. The fourth section deals with program organization, focusing specifically on the following areas: (a) organizational structure, (b) management function, (c) training function, (d) contractual function, (e) research function, (f) resource function, (g) evaluation function, (h) staffing the center, and (i) facilities. The fifth section looks at program operation, which is determined by the objectives of the Center together with the organizational design. Lastly, assessment of the teacher center operation is examined. (PB)

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Technology Education
Teacher Center

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Technology Education

Teacher Center

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Numerous individuals in the field of education have recognized a critical variable which militates against the improvement of education and educational systems. The variable is inservice teacher education in its many and diverse forms.

The conclusion of most researchers has been that inservice education, as traditionally conducted, is an outright failure. It seems that Goodlad (p. 61) is correct when he states that "education is probably the only large scale enterprise that does not provide for systematic updating of the skills and abilities of its employees."

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Millions of dollars are spent each year by teachers and school systems on inservice courses and degree programs. Yet, the overall results are not generally observable or measurable with respect to the improvement of the education of children and youth. The primary result, if not the primary goal, is additional certification and salary increases, not measurable improvements in the education of children.

In addition to the extensive amount of money and time devoted to the inservice process, considerable time and effort has been devoted to research about teaching and learning. Only a brief analysis of the present state of the efforts in inservice education and research is required to determine that <u>if</u> breakthroughs in research about teaching and learning are to be transferred to practice, <u>then</u> a new and more effective system must be devised for the inservice education and training of teachers.

One approach to meeting the need for a more effective system of inservice education has been the design and development of a new delivery system, one committed to improving teaching and learning. The new delivery system is called a <u>Teacher Center</u>.

There are many types and styles of teacher centers, some with specific missions, such as the Technology Education Teacher Center at West Virginia University which is the subject of this report.

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The Technology Education Teacher Center was designed as a pilot model for a specific field of study, technology education. The description of a teacher center, delimited to one field of study, should be a relatively easy task. This, however, is not the case, and for one specific reason. The teacher center is an entirely new concept. Educators with experiences in traditional inservice education efforts find the teacher center concept foreign to their thinking. They discover that to function effectively within a teacher center environment, they must develop entirely new ways of thinking and behaving with respect to inservice programs.

Those who have been involved in the design and implementation of the teacher center concept have discovered it is necessary to pursue the design and implementation from a perspective different from typical educational efforts. These efforts, for the most part, utilize workshops and graduate coursework for inservice education with the primary emphasis and focus on credentialling, not the improvement of instruction. The new inservice model is a change model. The criteria for success is actual, observable, measurable change in teaching and learning in real on-going classrooms. As a result, the subtleties of operation of a teacher center are highly complex and interrelated. The end results, however, for those interested in working with schools and teachers to improve the education of children, are significant and well

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beyond the expectations of experienced educators.

There are several significant topics which need to be discussed if the fundamental concepts of the design, development and operation of a technology education teacher center are to be understood. These include, historical background of the center, the design of the center (philosophy, assumptions, purpose and function), program plan, organizational plan, operational plan, and selected observations about the center with recommendations for future efforts.

The Technology Education Teacher Center

Historical Development

The Technology Education Teacher Center at West Virginia University was initiated through efforts by a Task Force of the NDEA National Institute for Advanced Study in Teaching Disadvantaged Youth. The work of the Task Force culminated in a publication entitled Teachers for the Real World, authored by B. Othanel Smith, Saul B. Cohen and Arthur Pearl, all members of the Task Force.

In the publication, the authors recommended the establishment of what they termed Training Complexes, the forerunner of teacher centers. The rationale supporting the recommendation was impressive. The focus was on training. The authors reminded educators that "student teaching was

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rated high by prospective teachers because it was the only work they have which resembles a training experience." Yet, the authors found, when they examined teacher preparation programs, that "there has never been a program of teacher training, only a program of courses ending with student teaching." Their recommendation for the improvement of classroom teaching was to retain the critical research and theory elements of teacher education and add a new component to the system which would focus on training. The training component of the new model would be called a training complex.

It was from the publication entitled Teachers for the Real World, and the ideas associated with the question of in-service training and performance, that the Technology Education Teacher Center at West Virginia University developed. There were, of course, a number of intervening steps.

Teachers for the Real World provided the impetus for the United States Office of Education to establish several national advisory committees, one of which was the Advisory Committee on Training Complexes. The Advisory Committee on Training Complexes convened first on February 27-28, 1970, and concluded its initial work on July 1, 1970. During this time period, the committee formulated a design for training complexes including operational assumptions, a descriptive definition, and guidelines for the establishment of training complexes. In addition, a number of proposed models for

training complexes were reviewed and evaluated. Included were the Japanese model, the English model and training models developed and operated by business and industry.

Following these studies, the Advisory Committee recommended that five (5) micro-pilot models be funded and tested, beginning in July 1970.

One pilot program recommended for funding was known as the Northern Appalachian Training Center for Teachers in the Technologies at West Virginia University. Initial development of the pilot program began in July 1970. For field use the pilot program was called the Training Program for Teachers in the Technologies (TPTT).

The micro-pilot program at West Virginia University was operated from July 1970, through June 1971, and was successful beyond original expectations. The present effort, called the Technology Education Teacher Center, is based on experiences of the pilot program. Each year the program has been altered and expanded according to the results of experience and the original design criteria.

To date, there have been five (5) developmental stages in the evolution of the Technology Education Teacher Center. Each stage of development coincides with yearly plans and projections for training programs for teachers in the technologies in West Virginia and the Appalachia Region.

1970-71 First Year. Pilot program. Implementation and assessment of technology training model developed for the project. Five county supervisors and ten teachers involved. Goal: Teach new technical content, design new units of instruction, and teach students in participating teacher's own classroom or laboratory. Cooperative program established with State Department of Education and Program Specialist for Industrial Arts. Curriculum Research and Resource Center established.

1971-72 Second Year. Continuation of first year effort. Sixteen new teachers involved. Program expanded to include efforts to train teachers (Training Associates) as field trainers. Two stages. Stage one included new content, new strategies of teaching in the technologies, the design of units of instruction, and the testing of the units in home classrooms. Stage two involved the

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development of beginning competencies necessary to serve as field trainers and adjunct staff members of the Training Program for Teachers in the Technologies. Precision teaching-learning unit development program initiated with eight teachers. Regional Training Meetings and Administrator Information Programs designed and implemented. Expansion of Curriculum Research and Resource Center. Program Specialist for Industrial Arts appointed as adjunct faculty member and co-director of Teacher Center Program.

1972-73 Third Year. Continuation of programs originated in first and second year with emphasis on Regional Training Meetings and Administrators' Information Meetings. Precision Teaching Learning Unit program continued. Expansion of Curriculum Research and Resource Center. Field Asso-

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ciate Training Program development continued. Design and operation of inservice program by teachers trained as field associates. Project Open Model conceived and developed. Two models initiated; the Consultant Model and the Teaching Model. Two Project Open contracts for curriculum development initiated. Training Program for Teachers in the Technologies Newsletter initiated.

1973-74 Fourth Year. Continuation of programs originated in first, second and third years. Full time coordinator of Teacher Center (Field Service Programs) employed. Additional facilities for Teacher Center obtained. Project Open Models implemented in two county school systems. N.A.S.A. program in aerospace education initiated. Inservice Workshops for teachers and administrators continued with

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emphasis on curriculum and instructional design. Q.R.C. (Quick Reaction Capability) program initiated with workshops on metrication and unified arts.

1974-75 Fifth Year. Continuation of programs originated in previous four years. Regional teacher and administrator workshops expanded. Q.R.C. program expanded to include programs on energy. Project Open Model expanded. Unified Arts program developed. N.A.S.A. program continued and Aerospace Workshop program initiated. Precision teaching-learning unit development program continued. Expansion of Project Open Model to three counties, five schools.

The history of the Technology Education Teacher Center has been one of constant growth and expansion of role. Much of the success of the center can be traced to the original design committed to inservice education.

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Design of the Technology
Education Teacher Center

The prime focus of the Technology Education Teacher Center, as originally conceived, was training, the training of inservice teachers. The focus on training required a new perspective, a new mentality on the part of those responsible for the operation of the center. Typical institutional organizations and viewpoints related to inservice education of teachers were found to be inadequate. The Technology Education Teacher Center, with a heritage derived from the training complex concept proposed by B.O. Smith in Teachers for the Real World, has a clearly defined training mission directed toward the development of complex, integrated skills appropriate for teaching in a variety of institutional settings. The present teacher center was developed with a focus on characteristics which differentiate a training complex or teacher center from other institutional programs. For instance, a training complex includes:

1. Provision for the active participation of those concerned with decision making regarding the training of educational personnel.
2. utilization of a wide range of resources: the schools, colleges, universities and

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community to develop and staff training programs.

3. opportunity for inservice (and pre-service) teacher training to be conducted in school settings, thus drawing on the strengths of the school by providing for real problems encountered in classrooms and in school organizations during the change process.
4. flexibility in employing personnel from varied backgrounds, with or without the standard credentials necessary in other settings.
5. utilization of the center staff in patterns not considered possible or appropriate in traditional university or school based inservice training programs.

Teacher centers are designed to meet a wide range of training needs. The operational mode is problem centered with the goal of solving problems, not of perpetuating antequated systems. The function of a teacher center is to train, to capitalize upon its unique environment and relationship to the educational process, and thereby provide direction to the kind of training required by educational personnel inservice. To do so, the teacher center provides, for personnel who have not been prepared to conduct successful

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instructional programs, access to identifiable and specific training contexts.

The teacher center operation, therefore, must be flexible in the development of training services. The services must be specific to the personnel, the region and to the educational environments in which they are provided.

Another characteristic which separates a teacher center and its activities from typical inservice efforts and curriculum development projects is that centers are interinstitutional and complex. They provide multiple outputs and require multiple, diverse, and specifically designed inputs. Centers are thus useful for installing systems which are innovative and expected to endure. Programs in which teacher centers are involved are best thought of as long range change models.

The Syracuse University Teacher Center Study Project defines a teacher center as:

> "a place or places where a program exists that offers educational personnel (inservice teachers, pre-service teachers, administrators, para-professionals, etc.) the opportunity to share, to have access to a wide range of resources, and to receive specific training."

The Technology Education Teacher Center at West Virginia University is compatible with this definition but

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differs significantly from typical teacher centers in many aspects, one of which is the focus on change. The Technology Education Teacher Center is focused on change and the program design is based on research on change. There are several reasons for this.

Many educators have stressed the need for change. They call for new curricula, new programs, new instructional media, and pilot programs, all for the purpose of improving the educational process. Calling for change is one thing. Actually attaining substantive, meaningful, and long term change is another problem, and a major problem.

Change and improvement in the teaching-learning process take place only when people are ready for change, when people are prepared, and when they have the competencies to initiate and carry out change. These criteria identify important functions which must be considered in the design of the teacher center. The purpose of the teacher center, therefore, becomes one of increasing the competency levels of teachers so they are more secure with change, more capable of engaging the questions of the quality of instruction, and more knowledgeable about the structure of schools in relation to learning inhibition and good teaching.

The emphasis of the technology education teacher center at West Virginia University has been on the individual teacher and his development as a self-sustaining teacher-

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scholar capable of engaging the questions and meeting the challenge of change. This process requires continual training and the movement of the concern for training and improvement in competence from the colleges, universities, and other public agencies to the individual. To attain this goal requires knowledge and implementation of the theories and practices of the change process. There is a vast body of literature on the change process which has implications for change. Some of the more important factors derived from the study of the change process are included in the following section on the Change Process.

The Change Process

Change is always occurring. The question is: What type and in what direction? Planned change is possible and is generally considered a desirable goal. We know we can attain change. We also know there is a large gap between theory and practice. In the field of education knowledge of both the theory and practice of change is weak.

We know that present day inservice teacher education programs produce little change which affects the quality of instruction. We know that one of the reasons for this is that programs are not evaluated. And we know that programs without precisely stated objectives are next to impossible to evaluate. In fact, evaluations of programs without

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performance objectives or criteria are largely subjective exercises in futility.

We know much more about change and the change process than most educators are willing to admit. It almost appears educators are reluctant to use the tools available to them for engaging in planned change.

We know that the variables affecting change involve diverse elements such as philosophy, people, programs, performance, places, practices, projections, and planning, to name a few. We know that the process of change is complex. We know that it requires knowledge and skill of a high order to direct planned change.

We know that many of the variables concerning change relate to the diversity of goals in education and the lack of a structure within the educational establishment to plan and manage change, including the preparation and training of such specialists as those required for quality control, the evaluators.

We know it will be necessary to create special organizations to service the change process including the critical variables of evaluation and training. School systems at present are not equipped to handle these functions without outside assistance.

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There are many suggestions and recommendations that could be made with respect to changing inservice teacher education. In fact, there are lists ranging from four or five items to twenty or more. Some variables are more critical than others.

For instance, if a decision is made by a given political entity, with direction and control over education, to change inservice teacher education, then action devoted to the following variables has been found to be in order.

1. Formulation of precise, long-term developmental plans.
2. Development of specialists including managers, change agents, and evaluation specialists.
3. Establishment of programs for the study of the change process, including research and evaluation.
4. Commitment of funding sources to long-term ventures so the critical variables of resources and follow-up can come into play.
5. Structuring all phases of the program so there is direct involvement of teachers in the process.
6. Designing all efforts so the focus of attention is directed from the part to the

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whole.

7. Creation of an "outside force" such as Training Centers with the long-term task of engaging the problem of improvement in the quality of instruction with particular attention to the first two years of a teacher's tenure.

Finally, a solution to the reward structure in education is a critical variable for personnel at all levels. This is important because: In the last analysis it is people who change programs. The question is: "Why should they?" (DeVore, p. 61).

These and other findings of research on change and change models focus attention on the creation of a new delivery system for teacher education, the teacher center. Teacher centers vary considerably in their missions and the designs and models utilized to carry out their missions. The Technology Education Teacher Center at West Virginia University is based on what has been described as the technology model.

The Technology Model

Fundamental to the design of the Center was the selection of a model from which structural and programmatic decisions could be made. The present design was

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based on a technology model with the assumption that self-realization, self-assurance and improved performance could be attained by teachers as their level of competency was raised. Competence and the "ability to do" enhance self-realization and self-assurance, critical elements in a successful teaching-learning equation.

The model, as conceived, was action oriented, as is technology, and met the center concept of providing brief, intensive opportunities for training in specific and identifiable categories.

Of the two training phases, pre-service and in-service, the center was primarily concerned with the inservice phase. Concentration on inservice problems was based upon the tenet that the way problems are solved and situations changed is by "starting from where you are."

A teacher center utilizing the technology model concentrates on solving problems related to improving instruction in as economical and efficient manner as possible. The issue was one of putting to work knowledge and techniques already available. Some of the basic premises were:

1. that the tasks to be identified would be those which teachers and others expressed as needs or which, as a result of involvement in training programs, teachers found

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relevant,

2. that tasks would be those which could be specified in performance terms and could be attained in short periods of time,
3. that the teacher center existed to provide services to local or regional educational personnel on contractual and other bases, and
4. that the success of the center would be measured in terms of continued use on the part of its clients.

Program Design

Analysis of individuals who have performed consistently at high levels indicated a lengthy training process built in small incremental segments. Each increment or segment added to the repertoire of the individual and increased his competence level. A high level of performance is reached in a step-by-step procedure and attained when the total, consisting of all the parts, is put together into a meaningful whole. Unfortunately for many teachers, some of the parts are missing and a vision of the whole is never attained.

Many solutions have been proposed to correct these voids. However, most methods and procedures are so

complex that highly trained experts are required for their application, thus making the solution low in efficiency and high in cost. In addition, the goal of disseminating training procedures to the local school level is obviated. The technology model is based on the assumption that the function of the Teacher Center is to find the means to teach all who are capable how to use and apply new techniques. Teachers have no faith in techniques which can be applied only by experts. This means the structure and program of the Technology Education Teacher Center must be geared to actual operational problems faced by the teachers in the field.

The concept of "starting from where the teachers are" is basic if real change is to take place. It is very difficult, if not impossible, to introduce radically new ideas without a lengthy period of preparation. Programs geared to actual operations have a greater chance of success. They also provide a much better base for continual change than do either short or long-term inservice programs begun on highly sophisticated levels or based on foreign, radical or esoteric ideas.

The real issues, then, are ones of structure and program. The technology model, starting from where the individual is and operating on the principle that competence is attained in short, specific, incremental stages,

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centers on tasks which are action or doing oriented. Problems are analyzed and divided into small segments suitable for short, highly defined training sessions. Immediacy and application to practice are the keys. The model is constant and on-going, utilizing all resources and expertise on an ad hoc basis as required by program goals and individual needs. The task analysis approach is used. Specificity is emphasized and the following assumptions utilized.

> . . . when performance expectations can be defined in precise behavioral terms, systems can be developed to prepare teachers to perform them.
>
> . . . when variables enter into performance expectations, a series of diagnostic questions can be designed to aid in the definition of the problem. The model suggests that trainers can be prepared to ask diagnostic questions and to apply appropriate solutions or select appropriate learning systems for teachers.
>
> . . . when a reward or payoff is within sight, behavioral and attitudinal changes are not only probable but

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reasonably certain.

. . . when teachers see specific connections between training programs, resultant proficiency on the job, and the level of status, responsibility, or income for which the training is to prepare them, attitudes toward training will be more positive.

Involvement with the technology model has indicated several other characteristics which should be noted. The focus is on the individual. Each individual becomes involved directly in the identification and development of his own program of improvement. The attempt is to develop awareness of potential and the skills and competencies required to attain a given competency level. The technology model concentrates on "what is to be." It is action oriented. It is designed to improve the teaching-learning environment, including the modes of thinking, doing, acting, and performing related to that environment.

The present program was designed and developed first as a pilot program utilizing limited resources. The goal was to develop a delivery system which could meet the criteria of less costs, more options. It was designed to determine answers with respect to the critical questions of

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(1) program and (2) structure prior to committing extensive resources to limited experience, know-how, and professional competency.

The problem was to design and develop a structure and program for a technology education teacher center which could reach critical mass; one that could provide sustained leadership and training for teachers in the technologies in the State of West Virginia and the Appalachia Region. There was, of course, a present on-going day-by-day, educational program in operation in West Virginia; a program with considerable tradition and much momentum. The objective was not to build a totally new structure or program. The objective was to work with what was, to start from where we were. The questions then became; "What is?" "How can critical mass be attained which will alter or change inadequate, and in many instances, non-existent teaching-learning processes in the technologies?"

One conclusion reached during the early design stages of the program was that the answers would rest with the inservice teaching population. It was assumed that if real change was to be made in the teaching-learning process, then the classroom teacher, the individual responsible for program operation at the local level, must receive help. The functions of the Technology Education Teacher Center became evident as soon as this assumption was stated.

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The present Center was designed to serve the function of providing the State and Region with a means for developing personnel qualified and capable of meeting the educational problems of a changing technological society. This required that procedures be designed to increase the knowledge and competency of educational personnel in:

1. facts, concepts, principles and processes of the discipline of technology
2. instructional strategies compatible with the discipline of technology
3. diagnostic skills consistent with the problems and issues of technology education
4. curriculum design for the study of technology
5. instructional design including precision teaching-learning units and
6. instructional resources for the study of technology

Other characteristics of the technology model, critical to the implementation and success of inservice education programs for teachers in the technologies, are derived from the processes of technology. In this context process means modes of thinking, doing and performing. The technology model is primarily task oriented and

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problem centered. It is, therefore, process oriented, focused on the future, adaptable and flexible. The emphasis is on problem solving and the methods of attacking problems using knowledge, analysis, synthesis, application to practice, evaluation and redesign, rather than problem doing which places emphasis on studying a body of knowledge for its own sake or dealing with problems already solved. Operated at its maximum potential, the technology model provides programs with a basis for projection and analogy, as well as a basis for assessment which utilizes two criteria, namely, economy and efficiency.

The technology model can be described best perhaps as a task analysis, performance based model. Implied is a hierarchy of goals and attainments which require different structural, programmatic and operational modes. The Technology Education Teacher Center at West Virginia University was designed not only as an on-going operational program but also as an on-going research effort to determine which structures, programs, or operational modes are most valid for the improvement of education in the technologies at all levels.

Purpose and Function

The Technology Education Teacher Center has been concerned primarily with people and their needs and

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competencies as teachers. The purpose, function, and scope of the programs of the Center have changed and adapted as the needs, problems and competencies of the clients have been altered by the program as well as by their continuing professional involvement in day to day teaching activities. Purposes and functions are thus altered by changes in the educational environment in which the Center operates. The criteria for success of the Center and the criteria for continued operation have been whether the program of the Center demonstrated to its constituency that its services met identifiable and agreed upon needs. The business of the Center was not to stay in business. Its business has been to help provide answers and meet the needs of teachers in the technologies in establishing contemporary and quality programs of instruction. The ultimate goal has been to meet the educational needs of the youth in West Virginia and Appalachia in the study of technology.

These purposes and functions required that the question of the types of training personnel and their qualifications be identified. In addition, operational procedures had to be developed to train personnel for program efforts at the local, county and district levels. The latter goal required that Center personnel engage in efforts which had the greater certainty of <u>multiplying</u>

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the initial effort. Critical to success in multiplying the initial efforts of teacher center personnel was direct involvement of inservice teachers in the change process, not only as learners but also as teachers of other teachers.

Another function, in addition to the role of personnel development, identified the role of the Center as an "outside force." The Center has had as its mission, not only the improvement of instruction through the retraining of individuals but also a role as a third or neutral party in the design and development of new educational programs. The Center functions, not as a part of the local, county, or district organization, but as a consultant with influence on positive change through legal agreement as well as professional expertise. Thus, the nature of relationships and responsibilities are different from those of typical inservice operations. Those working for the Center can initiate ideas, programs and procedures which those inside the system cannot or would not. The professional and interpersonal relationship are different. The Center then becomes a new variable, a positive variable in the change process. The Center as an <u>outside force</u> serves as a catalyst for change.

The Center attempts to function, as much as possible, in a <u>neutral</u> role. This means the Center delimits

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its formal attachment to specific University or State Education Department structures, other than to draw upon available resources. In a sense the Center exists as an autonomous entity. Therefore, those observing the operation of the Center recognize that the design, structure, and programs, together with the neutrality factor, are essential if the center is to fulfill its role.

In addition it is important to remember that the Center was designed to draw together and organize resources required to solve problems, rather than expend energies in identifying problems capable of being solved by existing resources and programs. The mode of operation thus becomes ad hoc and open rather than static and closed.

Program Objectives

The Program Plan for the Technology Education Teacher Center requires the development of specific objectives for specific and identified functional categories related to the Center's operation. The objectives provide direction for the Center's operation as well as a substantive base for assessment of the work of the Center. An indication of some of the objectives, by category, follow. By design, all objectives are stated in behavioral and performance.

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Primary Objectives

A. Organizational-Operational:

1. Provide direct, tangible and specific leadership for the people of the State and Region in meeting the needs of education in the technologies, at all levels, through the most economical and efficient means, by serving as a research, resource and personnel training center.
2. Study, develop, evaluate, and initiate activities which have the greater certainty of multiplying initial efforts in increasing the quality, scope, and effectiveness of teacher education programs in the technologies in the State and the Appalachian Region.
3. Provide the State and Region with an enterprise dedicated to aiding and assisting teachers in the technologies who are engaged in efforts to meet the needs of youth and adults through education in the technologies.
4. Provide the State and Region with an enterprise which serves as an "outside force" designed to create favorable climates conducive to motivation, sustained systematic planning, and other efforts required to aid people in rising above non-adaptive educational patterns in the

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technologies.

5. Develop and initiate effective and highly selective communication systems for the State to meet the problems and needs of education in the technologies. Systems should contain a "sensing" mode to determine weaknesses in the educational effort and a "scanning" mode designed to locate information and resources pertinent to the solution of identified problems.
6. Design, develop and operate an exemplary technological education research and resource facility adaptable to educational and technological change and capable of meeting the needs of the Center's programs.
7. Study, develop, initiate and evaluate change strategies suitable for improving education in the technologies in the Appalachian Region.

B. Instructional-Educational:

1. Design, develop and implement procedures for monitoring the educational process in the technologies at all levels of education, both formal and informal, for the purpose of identifying present and projected human resource needs.
2. Design, develop, initiate, and evaluate short-

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term training and retraining programs in the technologies for teachers in the field, at all levels of education, both formal and informal, for the purpose of providing the State and Region with personnel qualified and capable of meeting the educational problems of a changing technological society through procedures designed to increase the competency of these personnel in knowledge and performance in the areas of curriculum design, materials of instruction, technical content, instructional strategies, and leadership.

3. Identify and develop a taxonomy of teaching skills from which to determine selected instructional program offerings for implementation by the Center for teachers in the technologies.
4. Develop a matrix of potential instructional offerings from which a competency hierarchy can be determined and programmed, and contractual arrangements determined.

C. Field and Community Service:

1. Design, develop and initiate an in-service educational model which meets the following criteria:

a. motivates individuals toward continuous

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learning and maintains, improves, and adds to the competencies of those teaching in the technologies at various levels of education.

b. is flexible and adaptable to educational and technological change, and

c. is capable of serving the needs of individuals or groups within the local community, at regional centers or at the Technology Education Teacher Center depending on need, complexity of instruction, and resources required.

2. Develop a Regional Organizational Model whereby the Center serves as a resource for the initiation and operation of programs for the solution of localized and immediate educational problems in the technologies as a means of increasing the cost effectiveness of efforts within the Region through correlated and cooperative efforts.
3. Provide technical and educational field assistance for all levels of technological education in the State and Region.
4. Establish, in selected urban and rural areas of the State and Region, experimental and exemplary pilot programs designed to provide leadership in meeting the needs of education of children and

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youth in a technological society.

5. Initiate the utilization of pilot program facilities, on a contractual basis, for inservice technology education programs within the Region.
6. Coordinate and provide liaison activities with other organizations and enterprises in the State and Region concerned with technology and human resource development.

D. Education and Technology Resources:

1. Design, develop and evaluate program models, instructional models, materials of instruction, resource materials, teaching-learning units, physical facility designs and other software materials required for experimental, pilot and operating programs in the technologies as part of the technical, field service, and out-reach functions of the Center in meeting the needs of the State and the Region.
2. Develop, organize and publish a master Technology Education Resource File identifying human, physical, and published resources, both hardware and software, which are available to meet selected instructional and training needs.
3. Identify, evaluate, select, and publish a descriptive listing of basic readings and resources

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for study in the technologies at several learning levels.

Secondary Objectives

In addition to the primary objectives, concerned with rather specific areas of endeavor, the Center's activities are also determined by second order objectives.

1. Determine the specific nature of the many tasks related to the proper functioning of a Technology Education Teacher Center and establish a training hierarchy, in terms of personnel and the competencies required.
2. Study, develop, and select reward structures which enhance the productivity of training programs for teachers in the technologies by promoting interest in self improvement.
3. Evaluate the many types of performance categories required for the proper functioning of training programs for teachers in the technologies and determine the potential utilization of scientific and engineering manpower in meeting these needs.
4. Conduct a study of the type and nature of services desired and required by teachers and instructional programs. Utilize non-directive data gathering devices to determine contemporary

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needs as well as exploratory discussions of the future to determine potential needs.

5. Investigate, evaluate, select, and prepare guidelines for the operation of several modes of contractual programs.
6. Explore, assess, and determine the potential of establishing a multiple funding consortium for the diverse activities and needs of a technology education teacher center.
7. Design, develop, initiate, and operate pilot training centers in the technologies in selected schools in the Region for the purpose of establishing change models in an actual setting and as a base for training programs for teachers in the technologies.
8. Establish and publish minimum standards for facilities for technology education programs.
9. Establish operational procedures for satellite training centers and programs.
10. Investigate the practicability and potential of utilizing specifically designed mobile technology training laboratories for specialized areas of technology in rural regions.

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Program Organization

The nature of the operation of the Technology Education Teacher Center requires an organizational structure adaptable to variable and changing needs. It is not possible to foresee all the complexities of a teacher center operation, nor how best to ultimately organize, control and administer an on-going dynamic teacher center operation. However, there are some constants. The constants are not line and staff constants but, rather, perceptual constants, constants that result from the way one perceives the function and mission of the Center.

Organizational Structure

The constants determine governance and administrative structures as well as facilities and personnel. Thus, the organizational structure and administrative procedures of the Technology Education Teacher Center are dictated by basic assumptions underlying the technology model and the relationship of these assumptions to the goals and the objectives of the Center. The fact that the Center's mode of operation is problem oriented, task centered, and performance based determines, in large measure, the characteristics of the program and, therefore, the organizational structure and administrative procedures.

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In the design of the Center, the goal was to move toward an organic model adaptable to specific problems, rather than a mechanistic model suitable for status quo operations only. The result was the development of what is known as an ad hoc contractual approach.

The ad hoc contractual plan was adapted as the primary mode of operation of the Center and thus dictated, to a considerable extent, the organization structure of the Center. The plan was compatible with the technology model and provided a flexible and adaptable system capable of meeting immediate and long term needs.

The ad hoc contractual plan, properly managed, adapts to change quickly when contrasted with existing institutional approaches to inservice teacher education in the technologies.

There are many examples of the failure of various institutionalized training and education programs developed two, three, or four decades ago. The basic problem is the failure of these programs to come to grips with contemporary problems and needs. They continue to operate out-of-date programs which produce out-of-date people while using limited resources to reach inappropriate goals inefficiently. Contractual arrangements for space, equipment, materials, and instructional personnel provide a system superior to the establishment of permanent

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buildings, staff, and programs. Programs based on permanency become dated quickly and, in reality, many times stand in the way of progress, utilizing resources rather than solving problems.

The ad hoc contractual approach is a new approach to educational delivery and support systems for teacher education in the technologies. Several identifiable functional components have been found to be necessary. They are:

1. The Management Function
2. The Training Function
3. The Contractual Function
4. Research Function
5. Resource Function
6. Evaluation Function

The Management Function

The management function consists of planning, organizing, and controlling human and material resources in the execution of a program of action designed to attain given objectives. The balanced interaction of these functions is essential for the attainment of predetermined objectives, such as the primary and secondary objectives listed previously. These are identified and program plans developed based on the objectives prior to the initiation

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of any activities. This assures the fulfillment of the overall purpose of the teacher center program. The management phase includes: (1) planning, (2) organizing through the establishment of a precise "plan of action," (3) motivating all personnel in the implementation of the program, and (4) controlling the operation after it is set in motion to assure that the identified objectives are met.

The planning phase plays a crucial role in the operation of a Teacher Center program. Each activity of the Center involves careful delineation of the task or tasks in performance terms. Each plan of action involves activities in the categories of (1) organization, (2) data collection, (3) analysis, (4) synthesis, (5) proposed solutions and alternatives, (6) application to practice, and (7) evaluation. These are management functions as are those associated with controlling, which is based on specific delimited objectives and the development of reward structures and sanctions applicable to specific situations. Also included is the use of proven management tools such as PERT, GANTT, and PPBS, together with techniques such as discrepancy evaluation, trend analysis and management by exception. These techniques fix responsibilities and enable the Center to function in an economical and efficient manner.

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The Training Function

The training function includes the training of Center staff as well as the primary mission of inservice teacher training. Resident personnel at the Center and field personnel require continual training in order to carry out the mission of the Center. Included in the training efforts are regional trainers, curriculum developers, instructional designers, technical specialists, field instructors and field associates who are classroom teachers selected to serve as field trainers on an ad hoc contractual basis.

The training function is carried out by resident staff whenever possible. Otherwise contractual arrangements are made with qualified personnel.

The Contractual Function

This function consists of two components. One component involves the legal arrangements required for agreements developed between the Teacher Center and the schools or school systems for given services. The second component involves contracting by the Center for specific personnel and other services as required by the contracts with the school systems for training programs and other services.

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Included in the contracts are arrangements enlisting the assistance of schools and teachers in conducting experimental and pilot programs designed to develop and evaluate curriculum designs, instructional designs and training systems. Schools involved in pilot programs become operational technology education pilot programs and training centers. The contractual function thus serves a number of essential purposes including:

1. visibility of the Center's efforts in training, curriculum development and other services by education personnel and others through direct involvement and contribution to the Center's program and overall mission,
2. development of a cadre of teachers as potential field trainers for the Center,
3. development of instructional supervisors as potential managers of the Center's field operations,
4. establishment of a base from which to develop a hierarchy of trainers with various skill levels,
5. improvement of the nature of the educational system within which the pilot programs operate, and

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6. provision of a testing ground, at the operational and instructional level, for continued development of Center programs, structures and procedures.

There are several types of contractual programs in operation.

1. Inservice programs of various lengths which provide a series of training programs to selected groups of teachers on selected topics. These are conducted by resident staff of the Center and are usually one year in length.
2. Consultant programs which provide weekly inservice programs for two to five teachers for the purpose of developing and implementing new curriculum designs and instructional procedures. These are conducted by consultants employed for a specific school and are usually three years in length.
3. Teaching programs which provide curriculum development and implementation at a given school and grade level. These are conducted by a team of two doctoral level students who design, develop, and teach the new curriculum in the contract school.

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4. Inservice training programs and workshops. Usually one-session programs conducted by the Center staff after school hours, in the evening or on week-ends.
5. Services to schools and school districts in areas such as (a) curriculum design, (b) preparation of funding proposals, (c) course revision, (d) physical facility design, (e) curriculum evaluation, and (f) instructional resource planning.

Research Function

The research function of the Center involves a wide array of endeavors including: (a) curriculum design, (b) instructional design, (c) training techniques and procedures, (d) instructional models, (e) evaluation models, (f) value clarification, (g) personnel development systems, (h) technical developments, (i) status studies, and (j) projective studies, among others.

The Center is also involved in the continual study of technology and technological systems in order to maintain a base for the development of present and future endeavors in improving education in the technologies in the State and Region.

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Resource Function

This function is served primarily through the Technology Education Research and Resource Center of the Technology Education Program which provides print and physical resources including hardware and software for use by Center personnel and teachers from the field who are engaged in pilot or field programs of the Center. Included are primary reference and resource materials for the study of transportation systems, communication systems and production systems as well as reference materials for the study of technology and society.

The Research and Resource Center provides services such as information packets, which include materials on various new technical materials and devices, portable displays for use in field programs, technology bookshelves for specific technologies, and metric resource units.

Evaluation Function

The evaluation function is composed of two distinct efforts. One is the on-going day-by-day function carried on by the management phase of the program. The other is carefully delineated evaluation research conducted on a contract basis by an outside evaluation team and based on specified program goals and objectives.

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The former is based primarily on the Program Evaluation and Review Technique which is used as a management tool. The Program Evaluation and Review Technique (PERT) arranges activities in a logical framework for planning and controlling the operation and assures that the overall program goals are met within specified budgets and time limits. Prior to the initiation of a program, all major activities (phases) are PERT'ed. Major activities are designated by levels. Time required to complete activities and the resources needed for each are estimated. The PERT operation becomes quite complex and is more efficient if conducted by use of a computer. A short FORTRAN "front end" program is used which matches the data format to that of the Center's PERT program. Computer readouts then provide the staff with estimated completion dates for all activities, critical paths, and the slack times along non-critical paths. This is done for all levels prior to the implementation of field programs.

Charts are made for each activity and correlated with higher level charts. These charts, together with instructions for use, are published in a Program Planning Guide.

Estimated completion dates, generated through the computer program facilitate the scheduling of personnel and resources for major program activities. Ancillary or

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secondary level activities are scheduled by individual staff members who are responsible for the implementation of specific programs.

The PERT planning tool aids teacher center staff in reaching objectives and allows a series of concurrent yet different tasks to be accomplished in a prescribed order. Many individuals and educational organizations are involved in Center programs. Planning by the PERT process aids in coordinating efforts and in the fulfillment of the overall functions and goals of the teacher center.

In addition to PERT, GANTT and PPBS, other techniques are used in an on-going management and evaluation process.

Staffing the Center

The success of teacher centers will, in final analysis, be determined by one factor, personnel. This is a critical variable and raises the issue of the characteristics required of staff for Teacher Centers. Evidence indicates there are at least two broad categories of characteristics. One can be titled competencies and the other can be called perspective. Both are necessary components. The former, competencies, involves skills and knowledge. The latter, perspective, involves attitudes, values and conceptualization.

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Past experience indicates that staff for a teacher center involved in pilot programs and inservice education must have a far broader range and depth of skill and expertise than those who have been involved in typical inservice teacher education programs in the past.

The operation of a teacher center for teachers in the technologies is complex. The primary mission is training. The primary organizational plan utilizes a technology model. These two factors relate to the second category of characteristics required by teacher center staff, namely, attitudes, values and conceptualization. Unless the commitment of the staff to the training function is explicit and firm, the Center cannot be successful. The function of the teacher center is not to duplicate the research and instruction of pre-service teacher education programs. The function of a teacher center is training.

In addition, unless the staff comprehends and understands the technology model and utilizes precisely planned and executed training programs based on explicitly stated objectives, the teacher center program will not be any more successful than typical inservice programs. How the staff conceives the Center and its mission and their role as a part of the mission will determine to a considerable degree the success of the Center. The other

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variable is the requirement that the center staff be skilled, that they have the basic competencies necessary to function in a highly complex environment.

Staff training is an essential ingredient to the continued success of a teacher center. The entire operation requires the establishment of well defined goals, detailed planning and skillful implementation. Each phase requires highly trained individuals. This implies that personnel functioning as staff of the Center are involved in continual training. One of the myths of the educational profession in the past has been that credentialed individuals were qualified individuals. Experience with the operation of a technology education teacher center has proven this assumption false. Therefore, not only must the center be structured to meet the needs of its clients, it must also be structured to provide on-going training programs for center personnel and others associated with the program. Without this component, evidence indicates the effort will not be successful.

Facilities

The need for physical facilities varies with the on-going programs of the teacher center. There are, however, two types of facilities as well as several constants which provide a base for determining minimal

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facilities. The two categories of facilities are Field (on-site) facilities and Center facilities.

Field facilities are those facilities which the Center utilizes on a contractual loan or lease basis, either for short terms or long terms, depending on the type of program in which the Center is involved. Ordinarily the center utilizes classrooms or laboratories although private, public school, or community resources are also potential sources of facilities and have been utilized.

Center facilities are those facilities the Center utilizes on a permanent base for day-to-day operations. Based on experience, minimum facilities for a technology education teacher center should consist of:

1. Management Function Facilities
    a. Office for Center Coordinator
    b. Planning facilities
    c. Conference facilities
    d. Secretarial and clerical facilities
    e. Communication facilities including duplication facilities
2. Training Facilities
    a. Instructional facilities for staff training and resident inservice training programs

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b. Mobile laboratories to provide for specialized field training needs

3. Research and Resource Facilities

a. Technical laboratories

(1) development of instructional materials and devices

(2) testing of prototype instructional devices

(3) testing of instructional strategies with children

(4) development of laboratory designs and arrangements for programs of instruction

(5) teaching of technical skills for inservice programs

(6) teaching of technical information for inservice programs

b. Resource Center

(1) Curriculum development materials

(a) basic reference materials

(b) technical publications

(c) curriculum guides

(2) Publications--technical

(a) Production Systems

(b) Transportation Systems

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(c) Communication Systems

(d) Energy

(e) Materials

(f) Periodicals

(3) Publications--social/cultural

(a) Historical Studies

(b) Technology and Society

(c) Technology Assessment

(d) Technology Forecasting

(e) Technology and the Future

(f) Periodicals

(4) Publications--professional

(a) Curriculum Development

(b) Instructional Design

(c) History of Education

(d) Education Research

(e) Sociology of Education

(f) Philosophy of Education

(g) Periodicals

(5) Instructional Materials and Devices

(a) Films

(b) Transparencies

(c) Slides

(d) Film strips

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(e) Instructional kits

(f) Games

(g) Simulations

(h) Video tape cassettes

(i) Audio tapes

(j) Charts

(k) Pictures

(l) Precision teaching-learning units

(m) Vertical files

(n) Other

(6) Computer terminal

(a) PERT programs

(b) Wylbur programs

(c) Literature search, ERIC, etc.

(d) Research data

(e) Statistical analysis

Program Operation

The objectives of the Center, together with the organizational design developed to attain the objectives, determine the operational style of the Center. Operationally the Technology Education Teacher Center can be best described as a complex multi-faceted program with numerous major endeavors, including:

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1. regional inservice teacher education programs
2. field associate training programs
3. contractual precision teaching-learning unit development programs
4. experimental elementary school technology programs
5. cooperatively formulated contractual programs for the development of new curriculums and instructional programs for school systems
6. special workshops on:
   a. metrication
   b. elementary school technology
   c. unified arts
   d. transportation technology
   e. communication technology
   f. production technology
   g. aerospace education
7. Administrators' Information Meetings on Technology Education
8. Technology Education Research and Resource Center Development

All the programs conducted by the teacher center have been initiated and conducted cooperatively with the State Department of Education through the Program Specialist for Industrial Arts who serves as a liaison

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between county school systems and the teacher center.

The operational mode of the Center is also influenced by research findings on change and the change process. For instance, there are several conditions affecting educational change which dictate the operational procedures and structure of the Center. It has been found that the change process is enhanced when the following variables are operating:

1. participants are involved directly in the change process,
2. participants receive immediate feedback of the consequences of their behavior,
3. activities are perceived by the participants to be relevant to their needs,
4. learning activities are obviously carefully designed and directed to the attainment of established purposes, and
5. learning activities are reinforced by application to practice in actual field settings of new content and instructional strategies as part of the change process together with direct support from Center personnel during the application effort.

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Other findings related to the change process, which affect the operational mode and structure of the Center, concern educational personnel other than teachers. Analysis of research findings and experience with pilot programs in actual practice indicate that the involvement of chief school administrators, curriculum specialists, and principals is imperative if organized change is to occur.

Operationally, then, it is essential that the plans, procedures and activities of the Center involve these educators in the change model. For example, experience in the operation of the Center, has indicated that the following factors are critical:

1. analysis of the role of administrators, including superintendents, supervisors, curriculum directors and principals, is required to determine the level of involvement of each in determining direction for change in the local system,
2. determination of inducements which create a personal commitment for planned change on the part of administration is critical,
3. the sharing of the responsibility for change by all administrators is necessary if change is to become a continuous

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process, and

4. the commitment of administrators is critical if teachers implementing change are to receive the support necessary to assure success of the planned change.

In addition to these factors being essential in initiating planned change, adequate patterns of communication have been found to be necessary to guarantee a continued functioning of the change process.

Operationally, the program specialist from the State Education Department has been instrumental in establishing initial communication links between the Teacher Center and local education agencies and individual classroom teachers. Developing and maintaining communication with the field, once contractual arrangements have been completed, is the function of the Teacher Center Coordinator. During the operational phase of each project, all standard communication techniques are utilized including letters, reports, telephone reports, newsletter and field meetings.

In addition, the general mode of operation includes weekly planning and debriefing meetings by the Center staff where each project is discussed and actions initiated.

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Operational-Financing

The Technology Education Teacher Center has been supported from four sources since 1970. The primary source has been the United States Office of Education. Other support, in decreasing amounts, has been from contracts with: (1) local school systems, (2) the University, primarily in the form of physical facilities and part time personnel, and (3) the State Department of Education, both monetarily and through support personnel.

At the conclusion of the fourth year of operation, the Center reached the point in its development where the possibility of a self-sustaining operation, one without direct grants, was possible. At no time during the development of the Center have direct yearly grants exceeded $45,000. The range has been from $18,000 to $45,000. The past two years of operation have provided evidence that the contractual mode of financial support will provide the Center with the means of attaining self-sufficiency.

Operational--Staffing

The Teacher Center has been staffed, with the exception of the last two years, by part-time personnel. In 1973, the University created a full-time position, called the coordinator of field service programs, for the Technology Education Program. The Teacher Center is the

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field service operation of the Technology Education Program.

All other staff positions, with the exception of a full-time clerical position, have been part-time positions held by doctoral students in the Technology Education Program. This arrangement has not been entirely satisfactory, primarily because of the limited time part-time staff have for field work, a major element in the technology education teacher center model. Therefore, future plans call for the establishment of at least two full-time technology education extension positions.

Assessment of the Teacher Center Operation

A critical review of the organization and operation of the Technology Education Teacher Center leads to the conclusion that no large scale success has been attained. Significant numbers of teachers have not been retrained. Nor have large numbers of new curriculum development programs been initiated in public schools. What success the Center has had has been in the development, implementation and testing of a new delivery system for educational change in the technologies; a delivery system which has been proven, in a series of pilot programs, to be highly effective and for several specific reasons. The

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prime reason for success of the pilot efforts was due to the design of a model which called attention to variables such as problem identification, performance objectives, planning, task analysis, immediacy, application to practice, evaluation and personal involvement, all factors critical to the change process. The focus of the teacher center operation on change and the change process, together with basing the design and application of the Center's programs on research on change, provided a set of criteria by which the Center's programs could be designed and from which success could be measured.

The entire process of the inservice teacher education efffot was, therefore, change oriented. The criteria for success was whether the objectives were reached and whether the planned for change took place. This has been found to be critical factors if valid improvement of the teaching-learning process in the technologies is to be attained. It was learned, for instance, that the most effective conditions for dealing with change occurred when participants in inservice programs:

1. were directly involved in dialogue, discussion, and planning of their program of study.
2. received immediate feedback of the consequences of their behavior,
3. perceived the activities to be relevant to their concerns,

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4. were aware learning activities were carefully designed to accomplish clearly conceived purposes, and
5. were aware the efforts of the program focused attention toward the ultimate goal of field application.

These and other criteria are factors requiring consideration in the planning of any successful inservice program.

The Technology Education Teacher Center at West Virginia University has designed and tested a model which has the potential of providing and sustaining inservice education for teachers in the technologies. The organizational and operational patterns have proven to be effective in meeting the educational problems of a changing technological society. During the past five years the Center staff, utilizing a teacher center design based on the technology model and research on change, has been able to accomplish the following:

1. Motivated individuals toward <u>continuous learning</u> and the maintenance and improvement of their competencies in the technologies.
2. Designed a <u>flexible and adaptable</u> structure capable of meeting the needs of educational and technological change.

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3. Developed a model capable of serving the needs of individuals or groups within a local community, at regional centers or at the University Center depending on need, complexity of instruction and resources required.
4. Developed a model for short-term training and retraining programs for teachers at all levels in the technologies.
5. Developed procedures for contractual arrangements with schools and county education systems in fulfilling needs for curriculum design, instructional design, inservice education and other related efforts.
6. Served as an outside force for aiding personnel and schools in the design and implementation of change.
7. Developed a model for the identification, design, development and delivery of teaching-learning units for improving classroom instruction.

The teacher center is more than an alternative to traditional inservice programs. It is, in fact, a totally different type of organization which has the potential of fulfilling long standing needs of inservice teachers. As such, the teacher center concept may be the missing link

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in the teacher education process, namely, the training function. Properly conceived, organized, and operated, the teacher center has the potential for bridging the always present gap between theory and research and practice. If this ever present gap can be bridged, then there will be an increasing probability that education of young men and women in the technologies and other areas of the school curriculum can and will be improved. To do so, however, will require more than the singular effort evidenced by this report. What will be required is the multiplication of the effort by those interested in change, those committed to training, those committed to field work, and those committed to planning and the objective form of management. If individuals with these commitments begin the development of Technology Education Teacher Centers with the eventual goal of a network of centers nationally, then there can be a significant improvement of education in the technologies.

The authors of this report would be pleased to hear from individuals interested in teacher center development.

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